arrived at the second terminal node MN, despite the fact that the transmission information TI has arrived, a misbehaving second terminal node MN might achieve that it does not have to pay for the transmission information which it actually has received.

It should be noted that the above described problem of accurate accounting is only one sub-problem of the general problem that the gateway GW cannot provide an accurate flow control of the packets. For example, also other flow control mechanisms in the gateway GW might require accurate knowledge about the fact whether or not the transmission information TI has actually arrived at the desired target terminal node MN. For example, another flow control for the transmission information TI could involve the increase or decrease of transmission rate or the complete stoppage of transmitting transmission information TI if it was known that one of the wireless links on the main route MR or the alternative route AR has failed.

Another example of insufficient flow control is the occurrence of a congestion on the main route MR or alternative route AR which calls for a reduction of transmission rate. However, in conventional ad hoc networks the gateway GW has no possibility of detecting any reasons of loss of transmission information, such as noise, congestion or misbehaviour of users/devices.

In Bakre A.V. et al.:"Implementation and Performance Evaluation of Indirect TCP", IEEE Transactions on Computers, IEEE Inc., New York, U.S., Vol. 46, No. 3, 1 March 1997, pages 260-278, XP000685987, ISSN: 0018-9340, there is described an implementation and performance evaluation of indirect TCP. In more detail, there is presented the implementation and performance evaluation of I-TCP, which is

an indirect transport layer protocol for mobile wireless environment. Throughput comparison with regular TCP shows that I-TCP performs significantly better in a wide range of conditions related to wireless losses and host mobility. There is also described the implementation and performance of I-TCP handoffs.

Further, in US 2002/036991 A1 (Inoue Atsushi), there is described a communication system using access control for mobile terminals with respect to a local network. In a communication system, even when a mobile terminal device belonging to some mobile carrier does not have a right or a qualification for accessing the fixed communication network via the local network/gateway that is given in advance, this mobile terminal device is enabled to access the fixed communication network via the local network/gateway. This is achieved by carrying out a procedure for paying the fee from the user of the mobile terminal device to the fixed communication network provider or a procedure for monitoring the mobile terminal device.

Further, in Patent Abstracts of Japan, Vol. 2002, No. 11, 6 November 2002 & JP 2002 209028 A (Mitsubishi Electric Corp.), 26 July 2002, there is described an adhoc network where a start point terminal, relay terminals, and an end point terminal are used to dynamically configure a communication network. The relay terminal records a fact of communication path setting execution together with identifiers of the start point terminal and the end point terminal and the recording is used for a basis of charging information.

Further, in EP-A-0 903 905 (Tokyo Shibaura Electric Co.), there is described a scheme for reliable communications via radio and wire networks using transport layer connection. Here, a gateway device determines whether or not to carry out

a set-up of a connection in divided forms according to an information content of a packet that contains a transport layer protocol data unit requesting a set-up of the transport layer connection between the radio terminal of the radio network and the wire terminal of the wire network.

Further, in US 2002/045424 A1 (Lee Hee Dong), there is described a Bluetooth private network and communication method thereof. The Bluetooth private network comprises Bluetooth access points, each functioning as a base station in each of Bluetooth piconets, a gateway for functioning as an interface between a public network and the Bluetooth private network, sending a beacon signal to each of the Bluetooth devices in local Bluetooth networks to locate the Bluetooth device and a router for functioning as an interface between each of the Bluetooth access points.

SUMMARY OF THE INVENTION

As explained above, a conventional gateway GW and a conventional terminal node RN1-RN4, MN are deficient because they do not allow an accurate control of transmission information in the ad hoc network. For example, an adaptation of flow control parameters, such as transmission rate, transmission amount, as well as an accurate accounting is not possible in conventional ad hoc networks. The present invention aims at avoiding these disadvantages.

Specifically, it is an object of the present invention to provide a gateway, a terminal node of an ad hoc network, communication system as well as a method in an ad hoc network which respectively allow an accurate flow control of transmission information within the ad hoc network.

This object is solved by a gateway for forwarding transmission information between a first terminal node of a first network and a second terminal node of an ad hoc network having the features of claim 1.

Furthermore, this object is solved by a terminal node of an ad hoc network for exchanging transmission information with another terminal node of another network (IN) connected to said ad hoc network through a gateway having the features of claim 29.

The object is also solved by a method for forwarding transmission information between a first terminal node of a first network of a communication system and a second terminal node of an ad hoc network of said communication system, comprising the steps of claim 35.

The object is also solved by a method for forwarding transmission information between a first terminal node of a first network of a communication system and a second terminal node of an ad hoc network of said communication system, comprising the steps of claim 36.

An accurate flow control of the transmission information in the ad hoc network is possible in accordance with the invention, as defined above, because there is provided reliable information (acknowledgement information) indicating whether transmission information has reached the end terminal node or not. Furthermore, another advantage is that a misbehaviour of the second terminal node receiving the transmission information is inhibited because it is not possible for the second terminal node any longer to receive the transmission information without being charged for it.

The provision of accurate flow control of transmission information within the ad hoc network provides several advantages for example in connection with embodiments directed to an accurate accounting. For example, the accounting unit may be adapted to determine charging information for the transmission of said transmission information to said second terminal node if said acknowledgment information detection unit detects the receipt of acknowledgment information for the transmission of said transmission information to said second terminal station. Thus, the end terminal node is only charged for acknowledged transmission information.

If the second ad hoc network is a packet switched network, the transmission information comprises one or more transmission packets and said acknowledgement information comprises one or more acknowledgement packets, a transmission characteristics determining unit in accordance with claim 8 is adapted to determine the transmission characteristics for each acknowledged transmission package of the transmission information. Thus, an accurate accounting and charging is possible on a packet by packet basis.

Particularly advantageous is if said gateway comprises a sequence number insertion unit adapted to insert into each transmission packet a sequence number indicating the transmission order of the respective transmission packet in a sequence of transmission packets. Preferably, also said terminal node comprises a sequence number determining unit adapted to determine in each received packet a sequence number indicating the transmission order of the respective transmission packet in a sequence of transmission packets; wherein said acknowledgment information transmission unit is adapted to transmit to said gateway acknowledgment packets respectively containing the detected sequence number of the

received packet whose receipt is to be acknowledged with said respective acknowledgment packet. Thus, the gateway not only receives an acknowledgement information indicating that transmission information in general was received but an acknowledgement information which acknowledges particular transmission packets. Thus,

(... to be continued on page 15)

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New Claims

1. A gateway (GW) for forwarding transmission information (TI, TI', TI'') between a first terminal node (CN) of a first network (IN) and a second terminal node (RN1-RN4; MN) of an ad hoc network (AHN), comprising:

a) a transmission/reception unit (TRG) adapted to receive transmission information (TI, TI', TI'') from said first terminal node (CN) and to transmit said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN); and

b) an acknowledgment information detection unit (ACKM) adapted to detect the receipt of acknowledgment information (ACTAN, ACTAN', ACTAN'') from said second terminal node (RN1-RN4; MN) acknowledging that said second terminal station (RN1-RN4; MN) has received said transmission information (TI, TI', TI''); wherein

c) said transmission/reception unit (TRG) comprises a first tunnel setup unit (IPTUN) for setting up a first tunnel link (TUN1) between said gateway (GW) and said second terminal node (MN), wherein said transmission/reception unit (TRG) transmits said transmission information (TI, TI', TI'') and receives said acknowledgment information (ACTAN, ACTAN', ACTAN'') to and from said second terminal

node (MN) respectively through said first tunnel link (TUN1).

2. The gateway according to claim 1, ***further characterized by*** an accounting unit (ACC') adapted to determine charging information (CH) for the transmission of said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN) if said acknowledgment information detection unit (ACKM) detects the receipt of acknowledgment information (ACTAN, ACTAN', ACTAN'') for the transmission of said transmission information (TI, TI', TI'') to said second terminal station (RN1-RN4; MN).

3. The gateway according to claim 1, ***further characterized by*** a transmission information characteristics determining unit (TIM) adapted to determine transmission characteristics (TCH) of the transmission of said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN).

4. The gateway according to claim 1, ***further characterized in that*** said transmission information characteristics determining unit (TIM) is adapted to determine as said transmission characteristics (TCH) one or more selected from the group consisting of a data amount (DAM), a transmission speed (TRT), a transmission route (MR, AR) along which said transmission information (TI, TI', TI'') has been transmitted to said second terminal node (RN1-RN4; MN), and a delay time of the packet transmission.

5. The gateway according to claim 2 and 3, ***further characterized in that*** said accounting unit (ACC') is adapted to determine said charging information (CH) on the basis of said transmission characteristics (TCH).

6. The gateway according to claim 4, ***further characterized by*** a transmission information memory (TIS') adapted to store one or more selected from the group consisting of a source address (SAC) and a destination address (TA) of said transmission information (TI, TI', TI''), said determined transmission characteristics (TCH), said determined charging information (CH), and said acknowledgment information (ACTAN).

7. The gateway according to claim 1, ***further characterized in that*** said second ad hoc network (AHN) is a packet switched network (AHN), said transmission information (TI, TI', TI'') comprises one or more transmission packets (IP1-IP5), and said acknowledgement information (ACTAN, ACTAN', ACTAN'') comprises one or more acknowledgment packets (ACK1-ACK5).

8. The gateway according to claim 3 and 7, ***further characterized in that*** said transmission characteristics determining unit (TIM) is adapted to determine said transmission characteristics (TCH) for each acknowledged transmission packet (IP1-IP5) of said transmission information (TI, TI', TI'').

9. The gateway according to claim 4 and 7, ***further characterized in that*** said transmission information memory (TIS') is adapted to store said transmission characteristics (TCH) for each transmission packet (IP1-IP5) of said transmission information (TI, TI', TI'').

10. The gateway according to claim 7, ***further characterized by*** a sequence number insertion unit (SNI) adapted to insert into each transmission packet (IP1-IP5) a sequence number (SN; 1, 2, 3, 4, 5) indicating the transmission order of the respective transmission packet (IP1-IP5) in a sequence of transmission packets (IP1-IP5).

11. The gateway according to claim 10, ***further characterized by*** a transmission window unit (WIN) adapted to set a predetermined transmission window (WT) for said transmission/reception unit (TRG) to successively transmit transmission packets (IP1-IP3) to said second terminal node (RN1-RN4; MN); wherein

said transmission/reception unit (TRG) is adapted to successively transmit to said second terminal node (RN1-RN4; MN) transmission packets (IP1-IP3) within said transmission window (WT); and wherein
said transmission/reception unit (TRG) is adapted to slide said transmission window (WT) one or more packets to form a new transmission window (WT', WT'', WT''') and to successively transmit to said second terminal node (RN1-RN4; MN) one or more successive transmission packets (IP4, IP5) within said new transmission window (WT', WT'', WT''') which have not already been transmitted in the previous transmission window (WT) whenever the receipt of an acknowledgment packet (ACK1, ACK2), acknowledging the receipt of a transmission packet (IP1-IP3) of the previous transmission window (WT), is detected by said acknowledgment information detection unit (ACKM).

12. The gateway according to claim 11, ***further characterized in that*** said transmission window (WT) is one of the group consisting of a transmission time window indicating a predetermined transmission time period, a transmission window number of successive transmission packets, and a transmission window data amount indicating a predetermined amount of data to be transmitted in one or more of said successive transmission packets (IP1-IP3).

13. The gateway according to claim 12, ***further characterized in that*** said transmission window data amount (e.g. 1 MB) is the product between the transmission speed (TRT; e.g. 1 MB/s) on the transmission route (MR, AR) between said gateway (GW) and said second terminal (RN1-RN4; MN) and the round trip time (RTT, e.g 1s) which is the minimum time the gateway (GW) has to wait between transmitting a transmission packet (IP1-IP3) and receiving an acknowledgment packet (ACK1-ACK3) thereof.

14. The gateway according to claim 11, ***further characterized by*** a lost packet detector (LPD) adapted to detect that an acknowledgement packet (ACK2; Fig. 8) or a transmission packet (IP2; Fig. 9) has gone lost during its transmission if after transmission of a predetermined number of transmission packets (IP1-IP3) in the transmission window set by said transmission window unit (WIN), the sequence numbers (SN) in successive acknowledgment packets (ACK1, ACK3) do not match with those set in the successive transmission packets (IP1-IP3).

15. The gateway according to claim 11, ***further characterized by*** said lost packet detector (LPD) comprising a timer (T) adapted to count a predetermined time duration (ΔT), said timer (T) being started with each new transmission of a transmission packet (IP1-IP3), being stopped if an acknowledgement packet is received for the last transmitted transmission packet within said predetermined time duration (ΔT) or ,if not being stopped by the receipt of an acknowledgment packet, said timer (T) expiring, wherein said TRN stops transmission.

16. The gateway according to claim 7, ***further characterized by*** an acknowledgment request unit (SOL) adapted to transmit to said second terminal node (MN) an acknowledgment request packet (SOL_ACK3) including a

predetermined sequence number (SN) of a transmission packet (IP3) which was transmitted but for which no acknowledgement information has as yet been detected by said acknowledgment information detection unit (ACKM), said acknowledgment request message (SOL_ACK3) requesting from said second terminal node (MN) the transmission of an acknowledgment packet (ACK3) acknowledging the receipt of the transmission packet (IP3) having said predetermined sequence number (IP3).

17. The gateway according to claim 16 and 15, ***further characterized in that*** if said timer (T) times out and no acknowledgment information is detected by said acknowledgment information detection unit (ACKM) within said time duration after transmission of the last transmission packet (IP3) in said transmission window (WT), said acknowledgment request unit (SOL) is adapted to transmit to said second terminal node (MN) an acknowledgment request packet (SOL_ACK3) including the sequence number (SN) of the last transmission packet (IP3) transmitted in the transmission window (WT).

18. The gateway according to claim 15 and 17, ***further characterized in that*** said timer (T) is also started when said acknowledgment request unit (SOL) starts transmitting said acknowledgment request package (SOL_ACK3), wherein if said timer (T) times out thereafter and no acknowledgment information is detected by said acknowledgment information detection unit (ACKM) within said time duration after transmission of said acknowledgment request package (SOL_ACK3), said transmission/reception unit (TRG) stops transmission of further transmission packets.

19. The gateway according to claim 1, ***further characterized by*** a route check unit (RC) adapted to detect whether a

transmission route (MR, AR) to said second terminal node (MN) exists.

20. The gateway according to claim 19 and 17, ***further characterized by*** said acknowledgment request unit (SOL) is adapted to transmit to said second terminal node (MN) said acknowledgment request packet (SOL_ACK3) if after said timer times out, said route check unit (RC) detects that a transmission route (MR, AR) exists.

21. The gateway according to claim 19 and 17, ***further characterized by*** said transmission/reception unit (TRG) stops transmission of further transmission packets if after said timer times out, said route check unit (RC) detects that no transmission route (MR, AR) exists.

22. The gateway according to claim 7, ***further characterized in that*** said transmission/reception unit (TRG) is adapted to retransmit an already transmitted transmission packet (IP2) having a specific sequence number (2) in response to receiving a retransmission request packet (SEL_ACK3(2); SEL_ACK4(2)) including said specific sequence number (2; 2) from said second terminal node (MN).

23. The gateway according to claim 22, ***further characterized in that*** said first tunnel setup unit (IPTUN) sets up said first tunnel link (TUN1) by encapsulating transmission packets (IPx) into modified transmission packets (IPxx) generated and transmitted by said transmission/reception unit (TRG).

24. The gateway according to claim 23, ***further characterized in that*** said first tunnel setup unit (IPTUN) is adapted to respectively encapsulate a transmission packet (IPx) received from said first terminal node (CN) and having a global source address (SAC; S:1.1) of said first

terminal node (CN) and a global destination address (GAN; D:2:2) of said second terminal node (MN) into a modified transmission packet (IPxx) having an ad hoc source address (ADAG; S:A) of said gateway (GW) and an ad hoc destination address (ADAN; D:D) of said second terminal node (MN).

25. The gateway according to claim 22, ***further characterized in that*** said transmission/reception unit (TRG) comprises a second tunnel setup unit (TCPTUN) for setting up a second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1) between said gateway (GW) and said second terminal node (MN), wherein said transmission/reception unit (TRG) transmits said transmission information (TI, TI', TI'') and receives said acknowledgment information (ACTAN, ACTAN', ACTAN'') to and from said second terminal node (MN) respectively by using said second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1).

26. The gateway according to claim 25, ***further characterized in that*** said second tunnel setup unit (TCPTUN) sets up said second tunnel link (TUN2) by encapsulating transmission packets (IPx) received from said first terminal node (CN) into modified transmission packets (IPx') generated by said transmission/reception unit (TRG); and

said transmission packets (IPx'), which are encapsulated by said first tunnel setup unit (IPTUN) into said modified transmission packets (IPxx') transmitted by said transmission/reception unit (TRG), are said modified transmission packets (IPx') encapsulated by said second tunnel setup unit (TCPTUN).

27. The gateway according to claim 22, ***further characterized in that*** said first tunnel set up unit (IPTUN) sets up as

said first tunnel link (TUN1) an IP (Internet Protocol) protocol tunnel.

28. The gateway according to claim 25, ***further characterized in that*** said second tunnel set up unit (TCPTUN) sets up as said second tunnel link (TUN2) a TCP (Transfer Control Protocol) protocol or a stack of L2TP (Layer-2-Tunneling-Protocol) protocol, a PPP (Point-to-Point Protocol) protocol and a UDP (User Datagram Protocol) protocol.

29. A terminal node of an ad hoc network (AHN) for exchanging transmission information (TI, TI', TI'') with another terminal node (CN) of another network (IN) connected to said ad hoc network (AHN) through a gateway (GW), comprising:

a) a transmission/reception unit (TRN) adapted to receive transmission information (TI, TI', TI'') from said another terminal node (CN) through said gateway (GW); and

b) an acknowledgment information transmission unit (ACKSN) adapted to transmit to said gateway (GW) acknowledgment information (ACTAN, ACTAN', ACTAN'') acknowledging that said transmission/reception unit (TRN) has received said transmission information (TI, TI', TI''); wherein

c) said transmission/reception unit (TRN) comprise a first tunnel setup unit (TUN1) for setting up a first tunnel link (TUN1) between said second terminal node (MN) and said gateway (GW), wherein said transmission/reception unit (TRG) receives said transmission information (TI, TI', TI'') and transmits said acknowledgment information (ACTAN,

ACTAN', ACTAN'') from and to said gateway (GW) respectively through said first tunnel link (TUN1).

30. The terminal node according to claim 29, ***further characterized in that*** said ad hoc network (AHN) is a packet switched network (AHN), said transmission information (TI, TI', TI'') comprises one or more transmission packets (IP1-IP5), and said acknowledgement information (ACTAN, ACTAN', ACTAN'') comprises one or more acknowledgment packets (ACK1-ACK5).

31. The terminal node according to claim 30, ***further characterized by*** a sequence number determining unit (SND) adapted to determine in each received packet (IP1-IP5, Fig. 7; SOL_ACK3, Fig. 11) a sequence number (SN; 1, 2, 3, 4, 5) indicating the transmission order of the respective transmission packet (IP1-IP5) in a sequence of transmission packets (IP1-IP5); wherein

said acknowledgment information transmission unit (ACKSN) is adapted to transmit to said gateway (GW) acknowledgment packets (ACK1-ACK5) respectively containing the detected sequence number (SN; 1, 2, 3, 4, 5) of the received packet (IP1-IP5) whose receipt is to be acknowledged with said respective acknowledgment packet (ACK1-ACK5).

32. The terminal node according to claim 31, ***further characterized in that*** said sequence number determining unit (SND) is adapted to determine a sequence number (SN; 1, 2, 3, 4, 5) in a received transmission packet (IP1-IP3) or in an received acknowledgment request packet (SOL_ACK3), said acknowledgment request message (SOL_ACK3) requesting from said second terminal node (MN) the transmission of an acknowledgment packet (ACK3) acknowledging the receipt of the transmission packet (IP3) having said determined sequence number (IP3).

33. The terminal node according to claim 29, ***further characterized by*** a packet retransmission request unit (ARQ) adapted to transmit to said gateway (GW) a retransmission request packet (SEL_ACK3(2); SEL_ACK4(2)) including a sequence number (2; 2) of a transmission packet (IP2; IP2) which is requested to be retransmitted from said gateway (GW).

34. The terminal node according to claim 29, ***further characterized in that*** said transmission/reception unit (TRG) comprises a second tunnel setup unit (TCPTUN) for setting up a second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1) between said terminal node (MN) and said gateway (GW), wherein said transmission/reception unit (TRG) receives said transmission information (RI, TI', TI'') and transmits said acknowledgment information (ACTAN, ACTAN', ACTAN'') from and to said gateway (GW) respectively through said second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1).

35. A method for forwarding transmission information (TI, TI', TI'') between a first terminal node (CN) of a first network (IN) of a communication system (SYS) and a second terminal node (RN1-RN4; MN) of an ad hoc network (AHN) of said communication system (SYS), comprising the following steps in a gateway (GW) of said communication system (SYS):

a) setting up a first tunnel link (TUN1) in the ad hoc network between said gateway (GA) and said second terminal node (MN) and transmitting said transmission information (RI, TI', TI'') and receiving said acknowledgment information (ACTAN, ACTAN', ACTAN'') to and from said second terminal

node (MN) respectively through said first tunnel link (TUN1);

b) receiving (S5c1), in said gateway (GW) of said communication system (SS), transmission information (TI, TI', TI'') from said first terminal node (CN) and transmitting (S5c2), from said gateway (GW) via the first tunnel link, said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN); and

c) detecting (S5c5), in said gateway (GW), the receipt of acknowledgment information (ACTAN, ACTAN', ACTAN'') via the first tunnel link from said second terminal node (RN1-RN4; MN) acknowledging that said second terminal station (RN1-RN4; MN) has received said transmission information (TI, TI', TI'').

36. A method for forwarding transmission information (TI, TI', TI'') between a first terminal node (CN) of a first network (IN) of a communication system (SYS) and a second terminal node (RN1-RN4; MN) of an ad hoc network (AHN) of said communication system (SYS), comprising the following steps in said second terminal node (MN):

a) setting up a first tunnel link (TUN1) in the ad hoc network between said gateway (GA) and said second terminal node (MN) and transmitting said transmission information (RI, TI', TI'') and receiving said acknowledgment information (ACTAN, ACTAN', ACTAN'') to and from said second terminal node (MN) respectively through said first tunnel link (TUN1);

a) receiving (S5c3), in said second terminal node (MN) via the first tunnel link, transmission information

(TI, TI', TI'') from a gateway (GW) of said communication system (SYS); and

b) transmitting (S5c4), from said second terminal node (MN) via the first tunnel link to said gateway (GW), acknowledgment information (ACTAN, ACTAN', ACTAN'') acknowledging that said second terminal node (MN) has received said transmission information (TI, TI', TI'').

37. The method according to claim 35 or 36, ***further characterized by*** determining (S57), in said gateway (GW), charging information (CH) for the transmission of said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN) if the receipt of acknowledgment information (ACTAN, ACTAN', ACTAN'') for the transmission of said transmission information (TI, TI', TI'') to said second terminal station (RN1-RN4; MN) is detected.

38. The method according to claim 35 or 36, ***further characterized by*** determining (S54) transmission characteristics (TCH) of the transmission of said transmission information (TI, TI', TI'') to said second terminal node (RN1-RN4; MN).

39. The method according to claim 35 or 36, ***further characterized by*** determining (S54) as said transmission characteristics (TCH) one or more selected from the group consisting of a data amount (DAM), a transmission speed (TRT), a transmission route (RT; MR, AR) along which said transmission information (TI, TI', TI'') has been transmitted to said second terminal node (RN1-RN4; MN), and a delay time of the packet transmission along the transmission route to the second terminal node (MN).

40. The method according to claim 39, ***further characterized by*** determining (S57) said charging information (CH) on the basis of said transmission characteristics (TCH).

41. The method according to claim 40, ***further characterized in that*** said second ad hoc network (AHN) is a packet switched network (AHN), said transmission information (TI, TI', TI'') comprises one or more transmission packets (IP1-IP5), and said acknowledgement information (ACTAN, ACTAN', ACTAN'') comprises one or more acknowledgment packets (ACK1-ACK5).

42. The method according to claim 41, ***further characterized by*** inserting (S71) into each transmission packet (IP1-IP5) a sequence number (SN; 1, 2, 3, 4, 5) indicating the transmission order of the respective transmission packet (IP1-IP5) in a sequence of transmission packets (IP1-IP5).

43. The method according to claim 42, ***further characterized by*** setting (S7111) a predetermined transmission window (WT) to successively transmit transmission packets (IP1-IP3) to said second terminal node (RN1-RN4; MN); and

successively transmitting (S72, S721, S722) to said second terminal node (RN1-RN4; MN) transmission packets (IP1-IP3) within said transmission window (WT);

detecting (S61) the receipt of an acknowledgment packet (ACK1-ACK3) from said second terminal node (RN1-RN4) for said transmission packets (IP1-IP3) and sliding said transmission window (WT) one or more packets to form a new transmission window (WT', WT'', WT'''); and successively transmitting to said second terminal node (RN1-RN4; MN) one or more successive transmission packets (IP4, IP5) within said new transmission window

(WT', WT'', WT''') which have not already been transmitted in the previous transmission window (WT).

44. The method according to claim 43, ***further characterized in that*** said transmission window (WT) is one of the group consisting of a transmission time window indicating a predetermined transmission time period, a transmission window number of successive transmission packets, and a transmission window data amount indicating a predetermined amount of data to be transmitted in one or more of said successive transmission packets (IP1-IP3).

45. The method according to claim 44, ***further characterized by*** detecting (S81, S82; S91, S92) that an acknowledgement packet (ACK2; Fig. 8) or a transmission packet (IP2; Fig. 9) has gone lost during its transmission if after transmission of a predetermined number of transmission packets (IP1-IP3) in the transmission window set by said transmission window unit (WIN), the sequence numbers (SN) in successive acknowledgment packets (ACK1, ACK3) do not match with those set in the successive transmission packets (IP1-IP3).

46. The method according to claim 45, ***further characterized by*** counting (S103', S108'), with a timer (T) in said gateway (GW), a predetermined time duration (ΔT), said timer (T) being started with each new transmission of a transmission packet (IP1-IP3) and being stopped if an acknowledgement packet is received for the last transmitted transmission packet within said predetermined time duration (ΔT).

47. The method according to claim 35 or 36, ***further characterized by*** transmitting (S114), from said gateway (GW) to said second terminal node (MN), an

acknowledgment request packet (SOL_ACK3) including a predetermined sequence number (SN) of a transmission packet (IP3) which was transmitted but for which no acknowledgement information has as yet been detected in said gateway (GW), said acknowledgment request message (SOL_ACK) requesting from said second terminal node (MN) the transmission of an acknowledgment packet (ACK3) acknowledging the receipt of the transmission packet (IP3) having said predetermined sequence number (IP3).

48. The method according to claim 47, ***further characterized in that*** if said timer (T) times out and no acknowledgment information is detected by said acknowledgment information detection unit (ACKM) within said time duration after transmission of the last transmission packet (IP3) in said transmission window, transmitting (S114) to said second terminal node (MN) an acknowledgment request packet (SOL_ACK3) including the sequence number (SN) of the last transmission packet (IP3) transmitted in the transmission window.

49. The method according to claim 48, ***further characterized in that*** said timer (T) is also started when transmitting said acknowledgment request package (SOL_ACK3), wherein if said timer (T) times out thereafter and no acknowledgment information is detected within said time duration after transmission of said acknowledgment request package (SOL_ACK3), the transmission of further transmission packets is stopped.

50. The method according to claim 35 or 36, ***further characterized by*** detecting (S132, S142) whether a transmission route (MR, AR) to said second terminal node (MN) exists.

51. The method according to claim 45, ***further characterized by*** re-transmitting (S157, S159) an already transmitted

transmission packet (IP2) having a specific sequence number (2) in response to receiving a retransmission request packet (SEL_ACK3(2); SEL_ACK4(2)) including said specific sequence number (2; 2) from said second terminal node (MN).

52. The method according to claim 35 or 36, ***further characterized by*** setting up a first tunnel link (TUN1) between said gateway (GA) and said second terminal node (MN) and transmitting said transmission information (RI, TI', TI'') and receiving said acknowledgment information (ACTAN, ACTAN', ACTAN'') to and from said second terminal node (MN) respectively through said first tunnel link (TUN1).

53. The method according to claim 52, ***further characterized by*** setting up said first tunnel link (TUN1) by encapsulating transmission packets (IPx) received from said first terminal node (CN) into modified transmission packets (IPxx).

54. The method according to claim 53, ***further characterized by*** setting up said first tunnel (IPTUN) by respectively encapsulating a transmission packet (IPx) received from said first terminal node (CN) and having a global source address (SAC; S:1.1) of said first terminal node (CN) and a global destination address (GAN; D:2.2) of said second terminal node (MN) into a modified transmission packet (IPxx) having an ad hoc source address (ADAG; S:A) of said gateway (GW) and an ad hoc destination address (ADAN; D:D) of said second terminal node (MN).

55. The method according to claim 54, ***further characterized by*** setting up a second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1) between said gateway (GA) and said second terminal node (MN), wherein said transmission information (RI, TI', TI'') is

transmitted and said acknowledgment information (ACTAN, ACTAN', ACTAN'') is received to and from said second terminal node (MN) respectively through said second tunnel link (TUN2) encapsulated within said first tunnel link (TUN1).

56. The method according to claim 55, ***further characterized in that*** said setting up of said second tunnel link (TUN2) is performed by encapsulating transmission packets (IPx) received from said first terminal node (CN) into modified transmission packets (IPx'); and

said transmission packets (IPx'), which are encapsulated into said modified transmission packets (IPxx') in said first tunnel (IPTUN), are said modified transmission packets (IPx') encapsulated by said second tunnel setup unit (TCPTUN).

57. The method according to claim 35, ***further characterized in that*** said ad hoc network (AHN) is a packet switched network (AHN), said transmission information (TI, TI', TI'') comprises one or more transmission packets (IP1-IP5), and said acknowledgement information (ACTAN, ACTAN', ACTAN'') comprises one or more acknowledgment packets (ACK1-ACK5).

58. The method according to claim 57, ***further characterized by*** determining (S73) in each received packet (IP1-IP5, Fig. 7; SOL_ACK3, Fig. 11) a sequence number (SN; 1, 2, 3, 4, 5) indicating the transmission order of the respective transmission packet (IP1-IP5) in a sequence of transmission packets (IP1-IP5); and

transmitting (S74) to said gateway (GW) acknowledgment packets (ACK1-ACK5) respectively containing the detected sequence number (SN; 1, 2, 3, 4, 5) of the received

packet (IP1-IP5) whose receipt is to be acknowledged with said respective acknowledgment packet (ACK1-ACK5).

59. The method according to claim 58, ***further characterized by*** determining (S75) a sequence number (SN; 1, 2, 3, 4, 5) in a received transmission packet (IP1-IP3) or in a received acknowledgment request packet (SOL_ACK3), said acknowledgment request message (SOL_ACK3) requesting from said second terminal node (MN) the transmission of an acknowledgment packet (ACK3) acknowledging the receipt of the transmission packet (IP3) having said determined sequence number (IP3).

60. The method according to claim 59, ***further characterized by*** transmitting (S55'') to said gateway (GW) a retransmission request packet (SEL_ACK3(2); SEL_ACK4(2)) including a sequence number (2; 2) of a transmission packet (IP2; IP2) which is requested to be retransmitted from said gateway (GW).

61. The method according to claim 35, ***further characterized by*** setting up (S52', S56'; S52'') a first or first and second tunnel link (TUN1, TUN2) between said second terminal node (MN) and said gateway (GW) wherein reception of said transmission information (TI, TI', TI'') and said transmission of said acknowledgment information (ACTAN, ACTAN', ACTAN'') from and to said gateway (GW) is performed respectively through said first tunnel link (TUN1) or through said second tunnel link (TUN2) encapsulated in said first tunnel link (TUN1).

62. A computer program product, comprising code sections for respectively carrying out the functions of the gateway (GW) in accordance with claim 35.

63. A computer program product, comprising code sections for respectively carrying out the functions of the terminal node (RN1-RN4; MN) in accordance with claim 36.